

1 1. An isolated polynucleotide that encodes:

2 (i) a polypeptide comprising an amino acid sequence that is homologous to the  
3 amino acid sequence of a *Helicobacter* polypeptide selected from the group consisting of  
4 GHPO 15 (SEQ ID NO:2), GHPO 16 (SEQ ID NO:4), GHPO 36 (SEQ ID NO:6), GHPO  
5 38 (SEQ ID NO:8), GHPO 52 (SEQ ID NO:10), GHPO 57 (SEQ ID NO:12), GHPO 64  
6 (SEQ ID NO:14), GHPO 79 (SEQ ID NO:16), GHPO 84 (SEQ ID NO:18), GHPO 86  
7 (SEQ ID NO:20), GHPO 99 (SEQ ID NO:22), GHPO 106 (SEQ ID NO:24), GHPO 118  
8 (SEQ ID NO:26), GHPO 122 (SEQ ID NO:28), GHPO 128 (SEQ ID NO:30), GHPO 138  
9 (SEQ ID NO:32), GHPO 153 (SEQ ID NO:34), GHPO 160 (SEQ ID NO:36), GHPO 168  
10 (SEQ ID NO:38), GHPO 179 (SEQ ID NO:40), GHPO 189 (SEQ ID NO:42), GHPO 229  
11 (SEQ ID NO:44), GHPO 243 (SEQ ID NO:46), GHPO 244 (SEQ ID NO:48), GHPO 251  
12 (SEQ ID NO:50), GHPO 267 (SEQ ID NO:52), GHPO 269 (SEQ ID NO:54), GHPO 279  
13 (SEQ ID NO:56), GHPO 284 (SEQ ID NO:58), GHPO 296 (SEQ ID NO:60), GHPO 300  
14 (SEQ ID NO:62), GHPO 305 (SEQ ID NO:64), GHPO 319 (SEQ ID NO:66), GHPO 330  
15 (SEQ ID NO:68), GHPO 340 (SEQ ID NO:70), GHPO 342 (SEQ ID NO:72), GHPO 344  
16 (SEQ ID NO:74), GHPO 358 (SEQ ID NO:76), GHPO 373 (SEQ ID NO:78), GHPO 382  
17 (SEQ ID NO:80), GHPO 384 (SEQ ID NO:82), GHPO 398 (SEQ ID NO:84), GHPO 409  
18 (SEQ ID NO:86), GHPO 422 (SEQ ID NO:88), GHPO 430 (SEQ ID NO:90), GHPO 446  
19 (SEQ ID NO:92), GHPO 447 (SEQ ID NO:94), GHPO 450 (SEQ ID NO:96), GHPO 451  
20 (SEQ ID NO:98), GHPO 452 (SEQ ID NO:100), GHPO 456 (SEQ ID NO:102), GHPO  
21 461 (SEQ ID NO:104), GHPO 476 (SEQ ID NO:106), GHPO 478 (SEQ ID NO:108),  
22 GHPO 491 (SEQ ID NO:110), GHPO 511 (SEQ ID NO:112), GHPO 519 (SEQ ID  
23 NO:114), GHPO 526 (SEQ ID NO:116), GHPO 534 (SEQ ID NO:118), GHPO 536  
24 (SEQ ID NO:120), GHPO 542 (SEQ ID NO:122), GHPO 544 (SEQ ID NO:124), GHPO  
25 576 (SEQ ID NO:126), GHPO 578 (SEQ ID NO:128), GHPO 580 (SEQ ID NO:130),  
26 GHPO 585 (SEQ ID NO:132), GHPO 599 (SEQ ID NO:134), GHPO 639 (SEQ ID  
27 NO:136), GHPO 642 (SEQ ID NO:138), GHPO 647 (SEQ ID NO:140), GHPO 654  
28 (SEQ ID NO:142), GHPO 669 (SEQ ID NO:144), GHPO 710 (SEQ ID NO:146), GHPO

1 713 (SEQ ID NO:148), GHPO 716 (SEQ ID NO:150), GHPO 718 (SEQ ID NO:152),  
2 GHPO 726 (SEQ ID NO:154), GHPO 734 (SEQ ID NO:156), GHPO 740 (SEQ ID  
3 NO:158), GHPO 770 (SEQ ID NO:160), GHPO 782 (SEQ ID NO:162), GHPO 786  
4 (SEQ ID NO:164), GHPO 792 (SEQ ID NO:166), GHPO 797 (SEQ ID NO:168), GHPO  
5 816 (SEQ ID NO:170), GHPO 828 (SEQ ID NO:172), GHPO 839 (SEQ ID NO:174),  
6 GHPO 840 (SEQ ID NO:176), GHPO 842 (SEQ ID NO:178), GHPO 885 (SEQ ID  
7 NO:180), GHPO 889 (SEQ ID NO:182), GHPO 903 (SEQ ID NO:184), GHPO 912  
8 (SEQ ID NO:186), GHPO 946 (SEQ ID NO:188), GHPO 958 (SEQ ID NO:190), GHPO  
9 968 (SEQ ID NO:192), GHPO 987 (SEQ ID NO:194), GHPO 992 (SEQ ID NO:196),  
10 GHPO 996 (SEQ ID NO:198), GHPO 997 (SEQ ID NO:200), GHPO 1002 (SEQ ID  
11 NO:202), GHPO 1026 (SEQ ID NO:204), GHPO 1028 (SEQ ID NO:206), GHPO 1034  
12 (SEQ ID NO:208), GHPO 1038 (SEQ ID NO:210), GHPO 1059 (SEQ ID NO:212),  
13 GHPO 1065 (SEQ ID NO:214), GHPO 1072 (SEQ ID NO:216), GHPO 1073 (SEQ ID  
14 NO:218), GHPO 1088 (SEQ ID NO:220), GHPO 1091 (SEQ ID NO:222), GHPO 1105  
15 (SEQ ID NO:224), GHPO 1115 (SEQ ID NO:226), GHPO 1159 (SEQ ID NO:228),  
16 GHPO 1177 (SEQ ID NO:230), GHPO 1187 (SEQ ID NO:232), GHPO 1192 (SEQ ID  
17 NO:234), GHPO 1195 (SEQ ID NO:236), GHPO 1224 (SEQ ID NO:238), GHPO 1225  
18 (SEQ ID NO:240), GHPO 1228 (SEQ ID NO:242), GHPO 1229 (SEQ ID NO:244),  
19 GHPO 1231 (SEQ ID NO:246), GHPO 1236 (SEQ ID NO:248), GHPO 1242 (SEQ ID  
20 NO:250), GHPO 1248 (SEQ ID NO:252), GHPO 1270 (SEQ ID NO:254), GHPO 1271  
21 (SEQ ID NO:256), GHPO 1298 (SEQ ID NO:258), GHPO 1301 (SEQ ID NO:260),  
22 GHPO 1304 (SEQ ID NO:262), GHPO 1315 (SEQ ID NO:264), GHPO 1319 (SEQ ID  
23 NO:266), GHPO 1323 (SEQ ID NO:268), GHPO 1331 (SEQ ID NO:270), GHPO 1332  
24 (SEQ ID NO:272), GHPO 1347 (SEQ ID NO:274), GHPO 1373 (SEQ ID NO:276),  
25 GHPO 1376 (SEQ ID NO:278), GHPO 1380 (SEQ ID NO:280), GHPO 1394 (SEQ ID  
26 NO:282), GHPO 1407 (SEQ ID NO:284), GHPO 1415 (SEQ ID NO:286), GHPO 1425  
27 (SEQ ID NO:288), GHPO 1427 (SEQ ID NO:290), GHPO 1444 (SEQ ID NO:292),  
28 GHPO 1449 (SEQ ID NO:294), GHPO 1465 (SEQ ID NO:296), GHPO 1475 (SEQ ID

NO:298), GHPO 1479 (SEQ ID NO:300), GHPO 1483 (SEQ ID NO:302), GHPO 1488 (SEQ ID NO:304), GHPO 1496 (SEQ ID NO:306), GHPO 1524 (SEQ ID NO:308), GHPO 1536 (SEQ ID NO:310), GHPO 1539 (SEQ ID NO:312), GHPO 1540 (SEQ ID NO:314), GHPO 1542 (SEQ ID NO:316), GHPO 1555 (SEQ ID NO:318), GHPO 1560 (SEQ ID NO:320), GHPO 1564 (SEQ ID NO:322), GHPO 1570 (SEQ ID NO:324), GHPO 1588 (SEQ ID NO:326), GHPO 1604 (SEQ ID NO:328), GHPO 1605 (SEQ ID NO:330), GHPO 1619 (SEQ ID NO:332), GHPO 1629 (SEQ ID NO:334), GHPO 1642 (SEQ ID NO:336), GHPO 1654 (SEQ ID NO:338), GHPO 1661 (SEQ ID NO:340), GHPO 1673 (SEQ ID NO:342), GHPO 1687 (SEQ ID NO:344), GHPO 1692 (SEQ ID NO:346), GHPO 1693 (SEQ ID NO:348), GHPO 1699 (SEQ ID NO:350), GHPO 1738 (SEQ ID NO:352), GHPO 1745 (SEQ ID NO:354), GHPO 1746 (SEQ ID NO:356), GHPO 1754 (SEQ ID NO:358), GHPO 1792 (SEQ ID NO:360), GHPO 1795 (SEQ ID NO:362), and GHPO 1796 (SEQ ID NO:364); or

(ii) a derivative of said *Helicobacter* polypeptide.

2. The isolated polynucleotide of claim 1, which encodes a mature form of said *Helicobacter* polypeptide.

3. The isolated polynucleotide of claim 1, wherein the polynucleotide is a DNA molecule.

4. The isolated polynucleotide of claim 1, which is a DNA molecule that can be amplified by polymerase chain reaction from a *Helicobacter* genome.

5. The isolated DNA molecule of claim 4, which can be amplified by the polymerase chain reaction from a *Helicobacter pylori* genome.

6. The isolated polynucleotide of claim 1, which is a DNA molecule that encodes the mature form or a derivative of a polypeptide encoded by the DNA molecule of claim 4.

7. The isolated polynucleotide of claim 1, which is a DNA molecule that encodes the mature form or a derivative of a polypeptide encoded by the DNA molecule of claim 5.

8. A compound, in a substantially purified form, that is the mature form or a derivative of a polypeptide comprising an amino acid sequence that is homologous to a Helicobacter polypeptide selected from the group consisting of GHPO 15 (SEQ ID NO:2), GHPO 16 (SEQ ID NO:4), GHPO 36 (SEQ ID NO:6), GHPO 38 (SEQ ID NO:8), GHPO 52 (SEQ ID NO:10), GHPO 57 (SEQ ID NO:12), GHPO 64 (SEQ ID NO:14), GHPO 79 (SEQ ID NO:16), GHPO 84 (SEQ ID NO:18), GHPO 86 (SEQ ID NO:20), GHPO 99 (SEQ ID NO:22), GHPO 106 (SEQ ID NO:24), GHPO 118 (SEQ ID NO:26), GHPO 122 (SEQ ID NO:28), GHPO 128 (SEQ ID NO:30), GHPO 138 (SEQ ID NO:32), GHPO 153 (SEQ ID NO:34), GHPO 160 (SEQ ID NO:36), GHPO 168 (SEQ ID NO:38), GHPO 179 (SEQ ID NO:40), GHPO 189 (SEQ ID NO:42), GHPO 229 (SEQ ID NO:44), GHPO 243 (SEQ ID NO:46), GHPO 244 (SEQ ID NO:48), GHPO 251 (SEQ ID NO:50), GHPO 267 (SEQ ID NO:52), GHPO 269 (SEQ ID NO:54), GHPO 279 (SEQ ID NO:56), GHPO 284 (SEQ ID NO:58), GHPO 296 (SEQ ID NO:60), GHPO 300 (SEQ ID NO:62), GHPO 305 (SEQ ID NO:64), GHPO 319 (SEQ ID NO:66), GHPO 330 (SEQ ID NO:68), GHPO 340 (SEQ ID NO:70), GHPO 342 (SEQ ID NO:72), GHPO 344 (SEQ ID NO:74), GHPO 358 (SEQ ID NO:76), GHPO 373 (SEQ ID NO:78), GHPO 382 (SEQ ID NO:80), GHPO 384 (SEQ ID NO:82), GHPO 398 (SEQ ID NO:84), GHPO 409 (SEQ ID NO:86), GHPO 422 (SEQ ID NO:88), GHPO 430 (SEQ ID NO:90), GHPO 446 (SEQ ID NO:92), GHPO 447 (SEQ ID NO:94), GHPO 450 (SEQ ID NO:96), GHPO 451 (SEQ ID NO:98), GHPO 452 (SEQ ID NO:100), GHPO 456 (SEQ ID NO:102), GHPO 461 (SEQ ID

21 NO:104), GHPO 476 (SEQ ID NO:106), GHPO 478 (SEQ ID NO:108), GHPO 491  
22 (SEQ ID NO:110), GHPO 511 (SEQ ID NO:112), GHPO 519 (SEQ ID NO:114), GHPO  
23 526 (SEQ ID NO:116), GHPO 534 (SEQ ID NO:118), GHPO 536 (SEQ ID NO:120),  
24 GHPO 542 (SEQ ID NO:122), GHPO 544 (SEQ ID NO:124), GHPO 576 (SEQ ID  
25 NO:126), GHPO 578 (SEQ ID NO:128), GHPO 580 (SEQ ID NO:130), GHPO 585  
26 (SEQ ID NO:132), GHPO 599 (SEQ ID NO:134), GHPO 639 (SEQ ID NO:136), GHPO  
27 642 (SEQ ID NO:138), GHPO 647 (SEQ ID NO:140), GHPO 654 (SEQ ID NO:142),  
28 GHPO 669 (SEQ ID NO:144), GHPO 710 (SEQ ID NO:146), GHPO 713 (SEQ ID  
29 NO:148), GHPO 716 (SEQ ID NO:150), GHPO 718 (SEQ ID NO:152), GHPO 726  
30 (SEQ ID NO:154), GHPO 734 (SEQ ID NO:156), GHPO 740 (SEQ ID NO:158), GHPO  
31 770 (SEQ ID NO:160), GHPO 782 (SEQ ID NO:162), GHPO 786 (SEQ ID NO:164),  
32 GHPO 792 (SEQ ID NO:166), GHPO 797 (SEQ ID NO:168), GHPO 816 (SEQ ID  
33 NO:170), GHPO 828 (SEQ ID NO:172), GHPO 839 (SEQ ID NO:174), GHPO 840  
34 (SEQ ID NO:176), GHPO 842 (SEQ ID NO:178), GHPO 885 (SEQ ID NO:180), GHPO  
35 889 (SEQ ID NO:182), GHPO 903 (SEQ ID NO:184), GHPO 912 (SEQ ID NO:186),  
36 GHPO 946 (SEQ ID NO:188), GHPO 958 (SEQ ID NO:190), GHPO 968 (SEQ ID  
37 NO:192), GHPO 987 (SEQ ID NO:194), GHPO 992 (SEQ ID NO:196), GHPO 996  
38 (SEQ ID NO:198), GHPO 997 (SEQ ID NO:200), GHPO 1002 (SEQ ID NO:202),  
39 GHPO 1026 (SEQ ID NO:204), GHPO 1028 (SEQ ID NO:206), GHPO 1034 (SEQ ID  
40 NO:208), GHPO 1038 (SEQ ID NO:210), GHPO 1059 (SEQ ID NO:212), GHPO 1065  
41 (SEQ ID NO:214), GHPO 1072 (SEQ ID NO:216), GHPO 1073 (SEQ ID NO:218),  
42 GHPO 1088 (SEQ ID NO:220), GHPO 1091 (SEQ ID NO:222), GHPO 1105 (SEQ ID  
43 NO:224), GHPO 1115 (SEQ ID NO:226), GHPO 1159 (SEQ ID NO:228), GHPO 1177  
44 (SEQ ID NO:230), GHPO 1187 (SEQ ID NO:232), GHPO 1192 (SEQ ID NO:234),  
45 GHPO 1195 (SEQ ID NO:236), GHPO 1224 (SEQ ID NO:238), GHPO 1225 (SEQ ID  
46 NO:240), GHPO 1228 (SEQ ID NO:242), GHPO 1229 (SEQ ID NO:244), GHPO 1231  
47 (SEQ ID NO:246), GHPO 1236 (SEQ ID NO:248), GHPO 1242 (SEQ ID NO:250),  
48 GHPO 1248 (SEQ ID NO:252), GHPO 1270 (SEQ ID NO:254), GHPO 1271 (SEQ ID

NO:256), GHPO 1298 (SEQ ID NO:258), GHPO 1301 (SEQ ID NO:260), GHPO 1304 (SEQ ID NO:262), GHPO 1315 (SEQ ID NO:264), GHPO 1319 (SEQ ID NO:266), GHPO 1323 (SEQ ID NO:268), GHPO 1331 (SEQ ID NO:270), GHPO 1332 (SEQ ID NO:272), GHPO 1347 (SEQ ID NO:274), GHPO 1373 (SEQ ID NO:276), GHPO 1376 (SEQ ID NO:278), GHPO 1380 (SEQ ID NO:280), GHPO 1394 (SEQ ID NO:282), GHPO 1407 (SEQ ID NO:284), GHPO 1415 (SEQ ID NO:286), GHPO 1425 (SEQ ID NO:288), GHPO 1427 (SEQ ID NO:290), GHPO 1444 (SEQ ID NO:292), GHPO 1449 (SEQ ID NO:294), GHPO 1465 (SEQ ID NO:296), GHPO 1475 (SEQ ID NO:298), GHPO 1479 (SEQ ID NO:300), GHPO 1483 (SEQ ID NO:302), GHPO 1488 (SEQ ID NO:304), GHPO 1496 (SEQ ID NO:306), GHPO 1524 (SEQ ID NO:308), GHPO 1536 (SEQ ID NO:310), GHPO 1539 (SEQ ID NO:312), GHPO 1540 (SEQ ID NO:314), GHPO 1542 (SEQ ID NO:316), GHPO 1555 (SEQ ID NO:318), GHPO 1560 (SEQ ID NO:320), GHPO 1564 (SEQ ID NO:322), GHPO 1570 (SEQ ID NO:324), GHPO 1588 (SEQ ID NO:326), GHPO 1604 (SEQ ID NO:328), GHPO 1605 (SEQ ID NO:330), GHPO 1619 (SEQ ID NO:332), GHPO 1629 (SEQ ID NO:334), GHPO 1642 (SEQ ID NO:336), GHPO 1654 (SEQ ID NO:338), GHPO 1661 (SEQ ID NO:340), GHPO 1673 (SEQ ID NO:342), GHPO 1687 (SEQ ID NO:344), GHPO 1692 (SEQ ID NO:346), GHPO 1693 (SEQ ID NO:348), GHPO 1699 (SEQ ID NO:350), GHPO 1738 (SEQ ID NO:352), GHPO 1745 (SEQ ID NO:354), GHPO 1746 (SEQ ID NO:356), GHPO 1754 (SEQ ID NO:358), GHPO 1792 (SEQ ID NO:360), GHPO 1795 (SEQ ID NO:362), and GHPO 1796 (SEQ ID NO:364); or

(ii) a derivative of said *Helicobacter* polypeptide.

9. The compound of claim 8, which is the mature form or a derivative of a polypeptide encoded by a DNA molecule of claim 4.

10. The compound of claim 8, which is the mature form or a derivative of a polypeptide encoded by a DNA molecule of claim 5.

1 11. A method of preventing or treating Helicobacter infection in a mammal, said  
2 method comprising administering to said mammal a prophylactically or therapeutically  
3 effective amount of a compound of claim 8.

1 12. The method of claim 11, further comprising administering to said mammal an  
2 antibiotic, an antisecretory agent, a bismuth salt, or a combination thereof.

1 13. The method of claim 12, wherein said antibiotic is selected from the group  
2 consisting of amoxicillin, clarithromycin, tetracycline, metronidazole, and erythromycin.

1 14. The method of claim 12, wherein said bismuth salt is selected from the group  
2 consisting of bismuth subcitrate and bismuth subsalicylate.

1 15. The method of claim 12, wherein said antisecretory agent is a proton pump  
2 inhibitor.

1 16. The method of claim 15, wherein said proton pump inhibitor is selected from  
2 the group consisting of omeprazole, lansoprazole, and pantoprazole.

1 17. The method of claim 12, wherein said antisecretory agent is an H<sub>2</sub>-receptor  
2 antagonist.

1 18. The method of claim 17, wherein said H<sub>2</sub>-receptor antagonist is selected from  
2 the group consisting of ranitidine, cimetidine, famotidine, nizatidine, and roxatidine.

1 19. The method of claim 12, wherein said antisecretory agent is a prostaglandin  
2 analog.

1           20. The method of claim 19, wherein said prostaglandin analog is misoprostil or  
2   enprostil.

1           21. The method of claim 11, further comprising administering to said mammal a  
2   prophylactically or therapeutically effective amount of a second Helicobacter polypeptide  
3   or a derivative thereof.

1           22. The method of claim 21, wherein the second Helicobacter polypeptide is a  
2   Helicobacter urease, or a subunit or a derivative thereof.

1           23. A composition comprising a compound of claim 8, together with a  
2   physiologically acceptable diluent or carrier.

1           24. The composition of claim 23, further comprising an adjuvant.

1           25. The composition of claim 23, further comprising a second Helicobacter  
2   polypeptide or a derivative thereof.

1           26. The composition of claim 25, wherein said second Helicobacter polypeptide  
2   is a Helicobacter urease, or a subunit or a derivative thereof.

1           27. A method of preventing or treating Helicobacter infection in a mammal, said  
2   method comprising administering to said mammal a prophylactically or therapeutically  
3   effective amount of a polynucleotide of claim 1.



28. A method of preventing or treating *Helicobacter* infection in a mammal, said method comprising administering to said mammal a prophylactically or therapeutically effective amount of a polynucleotide of claim 4.

29. A method of preventing or treating *Helicobacter* infection in a mammal, said method comprising administering to said mammal a prophylactically or therapeutically effective amount of a polynucleotide of claim 7.

30. A composition comprising a viral vector, in the genome of which is inserted a DNA molecule of claim 3, said DNA molecule being placed under conditions for expression in a mammalian cell and said viral vector being admixed with a physiologically acceptable diluent or carrier.

31. The composition of claim 30, wherein said viral vector is a poxvirus.

32. A composition that comprises a bacterial vector comprising a DNA molecule of claim 3, said DNA molecule being placed under conditions for expression and said bacterial vector being admixed with a physiologically acceptable diluent or carrier.

33. The composition of claim 32, wherein said vector is selected from the group consisting of *Shigella*, *Salmonella*, *Vibrio cholerae*, *Lactobacillus*, *Bacille bilié de Calmette-Guérin*, and *Streptococcus*.

34. A composition comprising a polynucleotide of claim 1, together with a physiologically acceptable diluent or carrier.

1 35. The composition of claim 34, wherein said polynucleotide is a DNA molecule  
2 that is inserted in a plasmid that is unable to replicate and to substantially integrate in a  
3 mammalian genome and is placed under conditions for expression in a mammalian cell.

1 36. An expression cassette comprising a DNA molecule of claim 3, said DNA  
2 molecule being placed under conditions for expression in a procaryotic or eucaryotic cell.

1 37. A process for producing a compound of claim 8, which comprises culturing a  
2 procaryotic or eucaryotic cell transformed or transfected with an expression cassette of  
3 claim 36, and recovering said compound from the cell culture.

1 38. A method of preventing or treating Helicobacter infection in a mammal, said  
2 method comprising administering to said mammal a prophylactically or therapeutically  
3 effective amount of an antibody that binds to the compound of claim 8.